

1999

**Chief
Inspector
of Mines**

annual report



Ministry of Energy and Mines
Energy and Minerals Division

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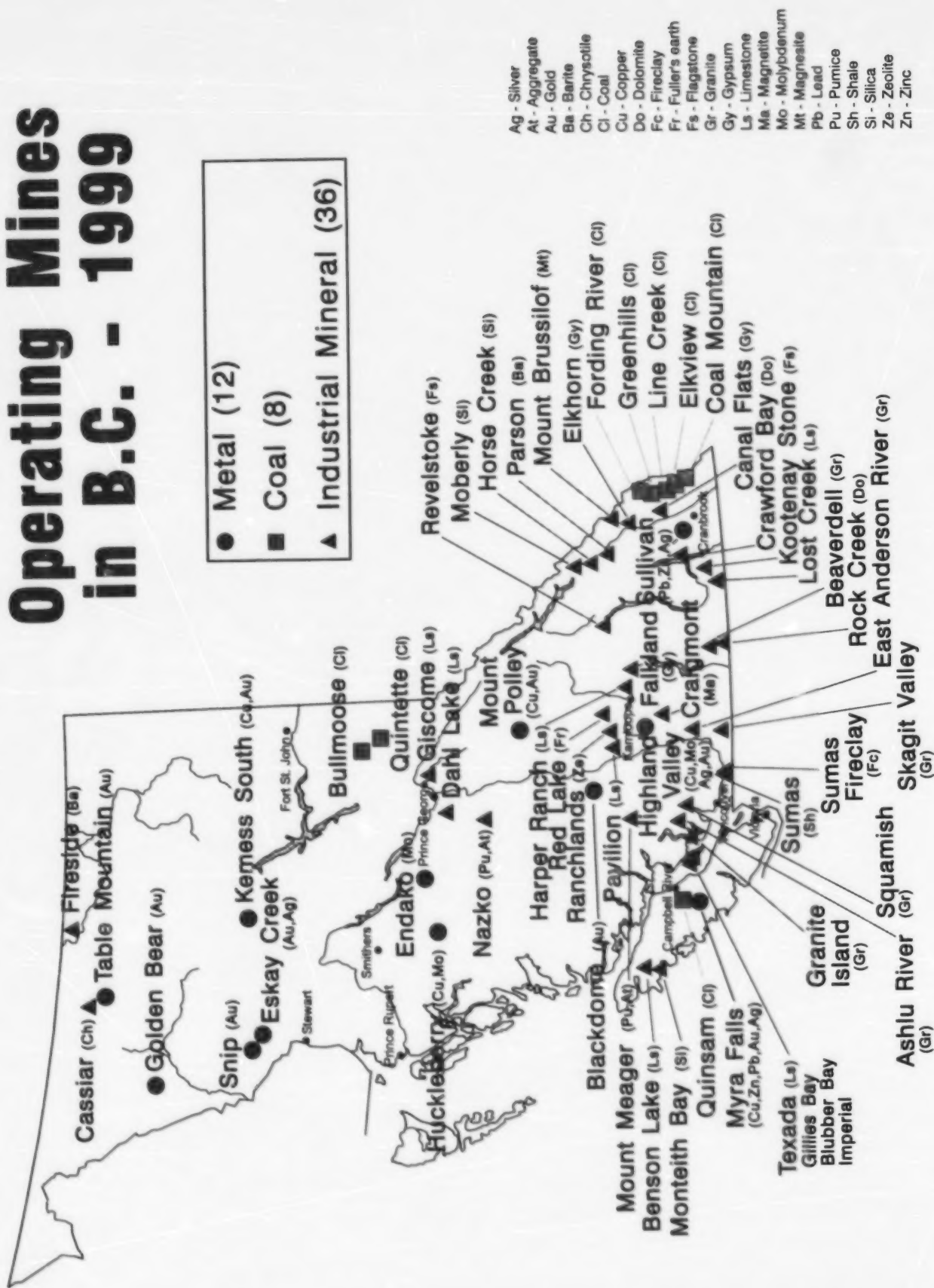
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Operating Mines in B.C. - 1999



Foreword

The Chief Inspector of Mines is appointed by the Minister of Energy and Mines to administer the *Mines Act* and the Health, Safety and Reclamation Code for Mines in B.C.

The Chief Inspector of Mines is also the director of the Mines Branch which functions through a central office in Victoria and five regional offices: Cranbrook, Kamloops, Nanaimo, Prince George and Smithers, plus a satellite office located in Fernie. Personnel in each of the regional offices are generally comprised of a regional manager supported by diverse technical and administrative staff. The regional manager in the Cranbrook office is responsible for the satellite office in Fernie.

Information about the ministry and copies of ministry publications are available through the following options:

Ministry Web site:
www.gov.bc.ca/em

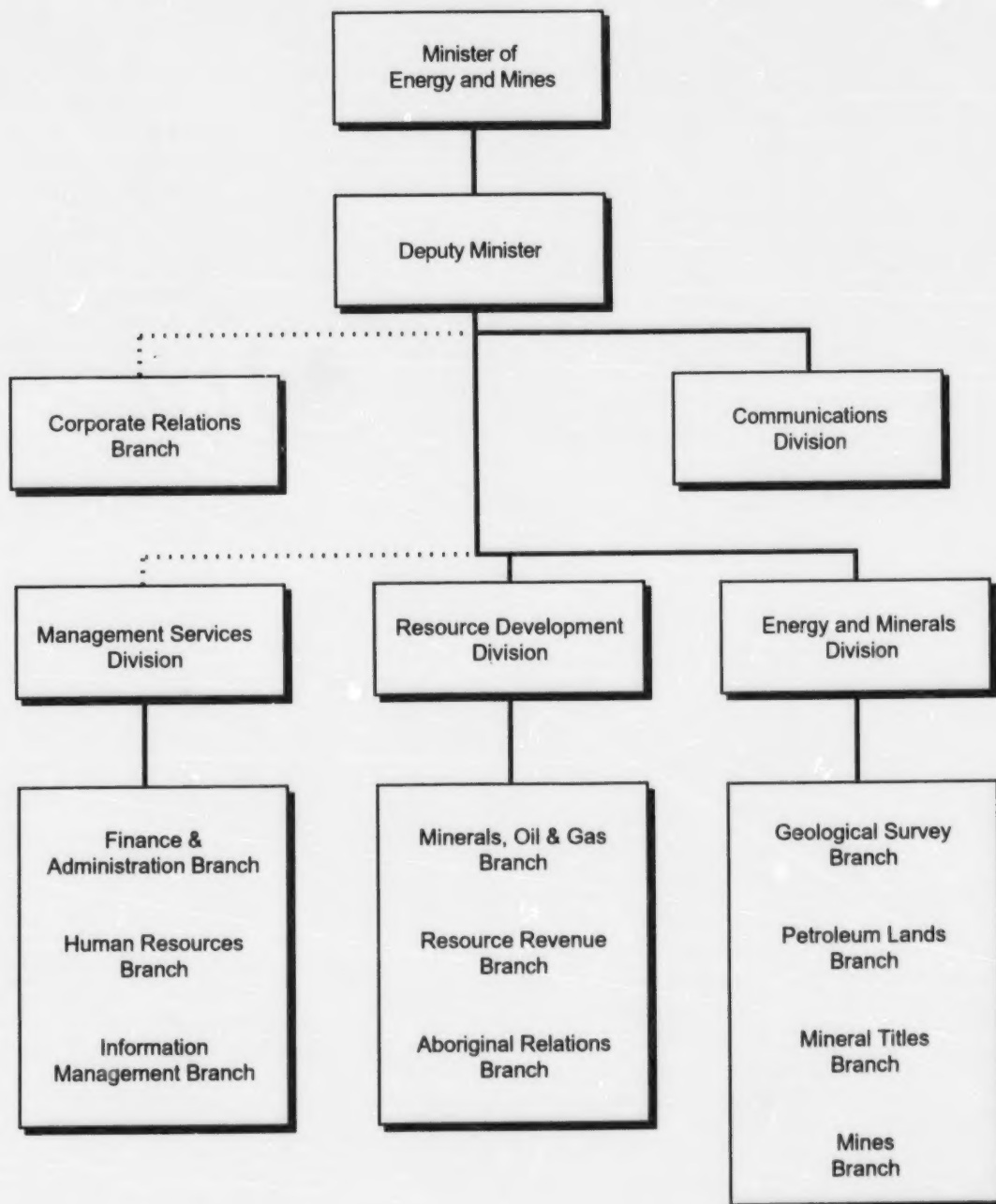
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Further information on the activities of the various mining companies can be found in the Canadian Mines Handbook published each year by Northern Miner Press Limited (604) 688-9908 or from each mining operation. In addition, you can contact the Mining Association of B.C. (604) 681-4321 and the Coal Association of Canada (403) 262-1544. Each issue annual reports on the status of those sectors.

Ministry of Energy and Mines Organization Chart



1.1 Mine Health and Safety Function

MANDATE/ACTIVITIES

The Mines Branch function derives its mandate from the *Mines Act* and its accompanying Health, Safety and Reclamation Code for Mines in B.C. (the Code).

The Code is reviewed on an ongoing basis, by the code review committee comprising representatives from labour, industry and government, and chaired by the Chief Inspector, to ensure it remains current with new technology, mining practices and health and safety concerns. The current edition of the Code was released in April 1997.

The key mandate of the branch with respect to health and safety is to ensure worker health and safety, and public safety. In order to accomplish this the branch functions include:

- the review of health and safety related aspects of mining and exploration proposals;
- mine inspections and the close monitoring of mining activity for conformance with the *Mines Act* and Code and the approval of mine plans with regard to health and safety concerns;
- the collection of data and maintenance of records with respect to accidents, dangerous occurrences, inspection frequencies and audiometric (hearing test) data; and,
- participation in research projects.

1.2 Mining Administration Function – non-health and safety component

MANDATE/ACTIVITIES

The Mines Branch administers and regulates the full mining cycle, including exploration, development, production, reclamation and closure for metal, placer, industrial mineral and coal mines, and gravel pits and quarries. This mandate includes the review of applications and issuance of permits under section 10 of the *Mines Act* for all mining activities including major mining projects subject to the *Environmental Assessment Act*, establishment of geotechnical and reclamation standards and security levels, participation in regional and subregional planning, and in reviews of draft legislation and policies being developed by other agencies. Branch staff also provide guidance and assistance to companies and individuals exploring for minerals, and monitor exploration and mining activities in order to provide policy advice to government.

In addition to health and safety functions, branch inspectors address environmental and social sensitivities of proposed and permitted mines. The process for review of *Mines Act* permit applications includes consultation with other government agencies and affected stakeholders, including First Nations, to identify concerns to be addressed through site-specific permit conditions. Inspectors monitor mining activities to ensure compliance with these permit conditions and take enforcement actions if necessary.

1.3 Land Use

MANDATE/ACTIVITIES

Branch staff participate in all levels of strategic and operational land-use planning throughout B.C. This includes regional, subregional (referred to as LRMP), landscape unit, local resource use, watershed management, recreational, access management, and sensitive area planning, as well as selection of new protected areas. In addition, various interagency referrals, including commercial recreation applications, proposed road deactivation, and draft Municipal Act zoning bylaws are handled. The overall aim is to optimize opportunities for exploration development of the province's subsurface resources in a way that integrates these activities with other land uses.

2.1 Occupational Health Group

ROLES AND RESPONSIBILITIES

The Health, Safety and Reclamation Code for Mines in B.C. (the Code) requires that mine managers develop a written occupational hygiene monitoring program. Larger operations in particular are required to establish procedures and to perform their own measurements of chemical and physical hazards to which workers were exposed in the workplace. This includes dusts (total and respirable), noise, gases and fumes, radiation (ionizing and non-ionizing) and heat/cold stress.

The Occupational Health (OH) group provides its expertise in recognizing, evaluating and controlling these conditions as well as assistance in developing individual programs. In addition, the group makes comparative measurements to ensure companies follow proper methodology and obtain accurate results. Underground mine ventilation and workplace hazardous materials information system programs are

also included in the group's responsibilities. Mine managers are also required to provide their occupational health and safety committees with training with respect to the prevention and reporting of musculoskeletal disorders. Such disorders include lower back pain, carpal tunnel syndrome and tendonitis.

The OH group was also involved in providing training to occupational health and safety committees at mines in these subjects.

STRUCTURE AND ORGANIZATION

During 1999 there were five people in the OH group, a manager, three industrial hygiene inspectors and one administrative assistant. Two additional part-time staff were hired under the youth employment and youth internship programs.

SUMMARY OF ACTIVITIES

There were a wide variety of occurrences and situations in 1999 which required attention from the OH group. Of note were:

- considerable concern by neighbours of smaller quarry and sand and gravel operations where dust and noise were involved, requiring a number of investigations; and,
- the review of several asbestos abatement projects during building renovations and demolitions at minesites across the province.

In addition, the OH group:

- completed revisions to the Mines Branch audiometric database, converting it from a mainframe to personal computer-based system;
- wrote and published an audiometric technician training manual;
- provided training courses for mines' industrial audiometric technicians;
- provided training to mine safety personnel with respect to occupational health hazards and

- applicable occupational monitoring methods;
- published and distributed to all major mines a revised manual entitled Workplace Monitoring Procedures Manual; and,
- initiated the development of a training manual for the reduction of musculoskeletal disorders at mine sites, with the assistance of a consultant, and conducted a number of seminars across the province to help prepare mines for the Code's requirements with respect to training programs for musculoskeletal disorder prevention.

In addition to the above, OH inspectors conducted on-site inspections of mines to fulfill their mandate to monitor workplace conditions.

During the year, 54 inspections were carried out and 204 orders were issued.

2.2 Mechanical Engineering, Electrical Engineering and Emergency Preparedness

ROLES AND RESPONSIBILITIES

Mechanical and electrical inspectors ensure that all mechanical and electrical equipment installed and used at mines complies with the *Mines Act* and the applicable codes and standards, and that the equipment is maintained in acceptable condition so that its operation causes no hazard to people or property.

The emergency preparedness inspector ensures that all mines have an emergency preparedness plan capable of being implemented at any time in response to any emergency occurring at the mine site. Emergency preparedness plans are integrated with a province-wide protocol that provides for aid and assistance from outside sources, if required, to any mine experiencing an emergency.

STRUCTURE AND ORGANIZATION

In 1999 there were eight staff in the mechanical/electrical group: one manager, two engineers, four technicians and one administrative assistant.

SUMMARY OF ACTIVITIES

Mechanical Engineering

Inspections were carried out at all of the major mining operations, including the larger quarries and sand and gravel pits.

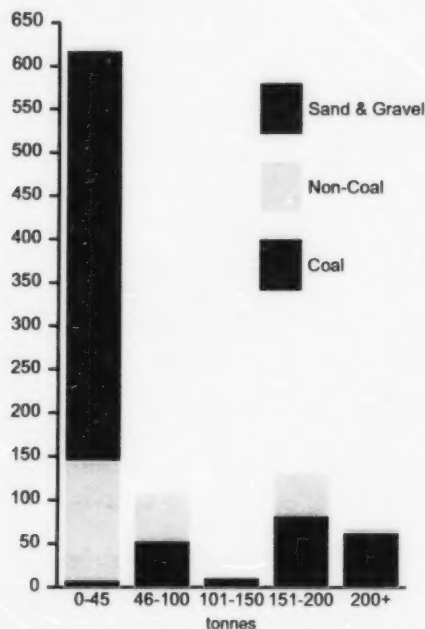
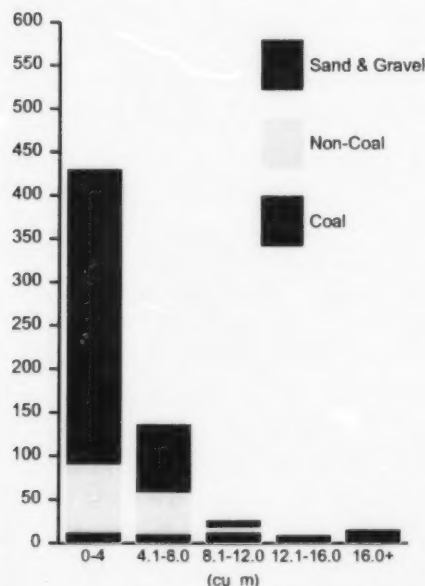
Several submissions of data pertaining to new or modified off-highway haul trucks were approved, and numerous minor modifications on various items of mobile equipment were also reviewed, with approvals issued in the majority of cases.

Delivery of new machinery and equipment to mines, together with the steady upgrading of much of the existing items, results in mines in British Columbia maintaining their competitive capabilities. At the same time, safety systems on new and upgraded equipment are usually enhanced, often as a result of new technology employed in such systems. The highly automated and complex control systems found on the equipment demands a high level of skill from those who operate and maintain the equipment. Branch staff involved in reviewing engineering drawings associated with the safety systems on such equipment, and subsequently having to perform field inspections on the items, endeavor to keep abreast of the many changes and innovations. In addition, inspectors, in collaboration with the mines, have to ensure that people operating equipment are aware of how equipment modifications may affect its operating functions, and ensure operators understand the consequences of failures occurring in installed control or sensing systems.

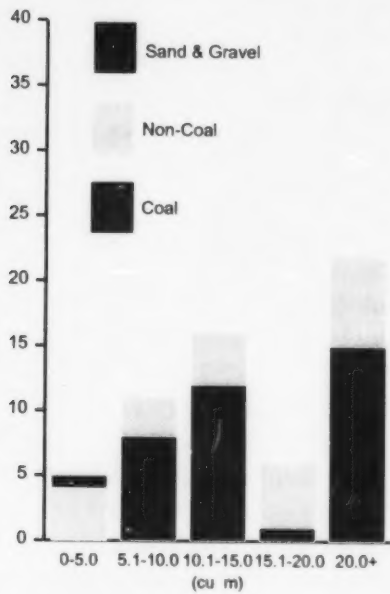
Responsibility for the mine safety audit system remains the responsibility of the manager of the section. In 1999, safety audits were carried out at two major mines; Quinsam Coal Corporation

(underground coal mine) and Mount Polley (surface metal mine). The safety audit program is designed to investigate how well a safety and health program has been implemented at a mine. A mine is visited by an audit team, consisting of between two and five staff members and a representative cross section of employees at the mine, who are interviewed, and an inspection is conducted of the records forming part of the safety and health program instituted by the company. Audit questions and record checks are based primarily on the requirements of the *Mines Act* and regulations pertaining to the health and safety of workers. Both the interviews and records checks enable the auditors to determine whether the program

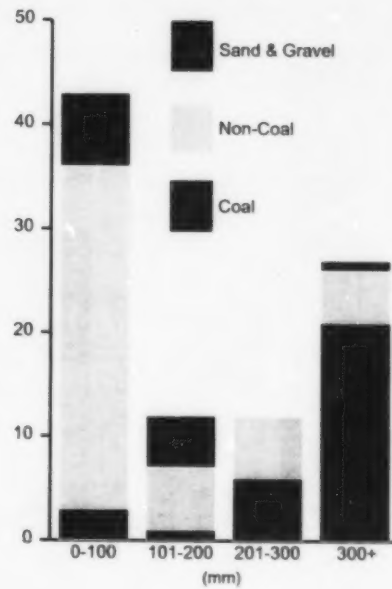
is well administered, and to determine how much knowledge employees have about how to perform their work tasks in a safe and healthful manner. When the on-site portion of each audit is completed, the information is analyzed and a report is issued to the mine manager who then discusses its contents with the occupational health and safety committee. Strengths and weaknesses of the program are highlighted in the report and a plan of action to improve the occupational health and safety program is developed at the mine. Follow up of the implementation records checks enable the auditors to determine whether the program is well administered.

Surface Use of Haul Trucks at Mines**Surface Use of Front-End Loaders at Mines**

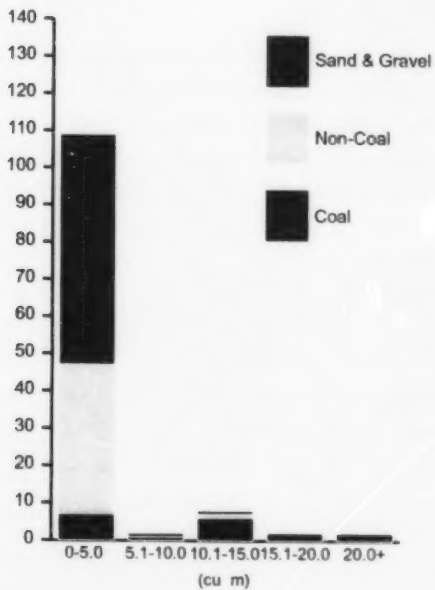
Surface Use of Electric Shovels at Mines



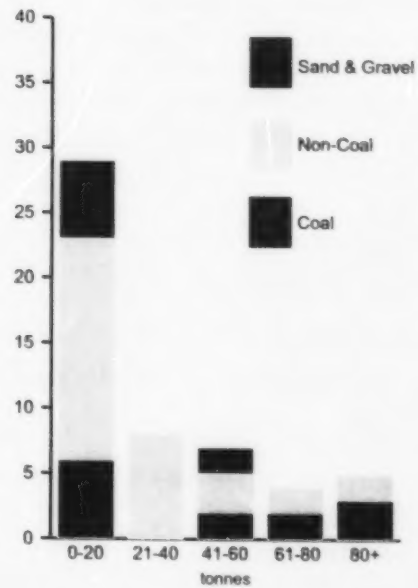
Surface Use of Rotary Drills at Mines



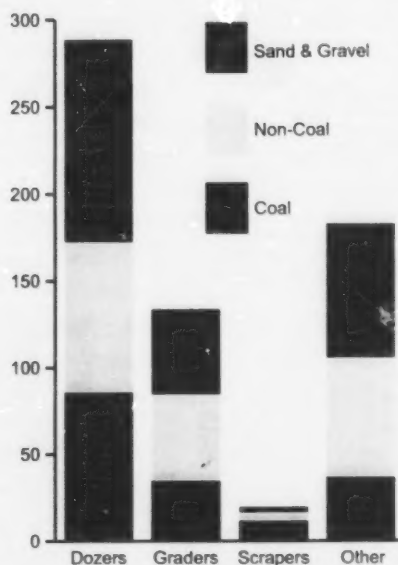
Surface Use of Hydraulic Shovels at Mines



Surface Use of Mobile Cranes at Mines



Surface Use of Other Equipment at Mines



Electrical Engineering

Electrical inspections were conducted at all major mines including the larger sand and gravel operations as well as the smaller operations that demanded an in-depth electrical inspection. Most mines are still continuing to upgrade their electrical equipment and systems in order to increase efficiency and reduce power consumption costs.

The following information describes electrical power consumption at mines in B.C. in 1999:

Metalliferous Mines

Reported power generated at company-owned generating plant

97,640,052 kW-h

Reported power purchased from public utilities

1,758,765,809 kW-h

Total Power Consumption

1,856,405,861 kW-h

Coal Mines

Reported power purchased from public utilities

568,132,793 kW-h

Industrial and Structural Materials

Reported power generated at company-owned generating plants

4,681,019 kW-h

Reported power purchased from public utilities

35,053,740 kW-h

Total Power Consumption

39,734,759 kW-h

Emergency Preparedness

Mine emergency preparedness plan guidelines and mine emergency management plans were established in 1991, first published in October 1992 and last updated in January 1997. The guidelines are distributed to the mining industry to use when setting up on-site preparedness plans. The management plans are distributed to proponents within the plan and are also for use by ministry staff.

Mine Rescue Stations

Regional mine rescue stations were consolidated in 1999. All mine rescue equipment is now located in a single centrally located station in Kamloops. The station is under the supervision of the regional office administrator/resident engineer and the manager, emergency preparedness, in Victoria.

Mine Rescue Certifications

To qualify for mine rescue certification, mine employees must complete approved training and must pass written exams developed for various types of mining, as per Part 3 of the Health, Safety and Reclamation Code for Mines in B.C.

The Mines Branch is responsible for certifying miners in several categories of mine rescue, as listed below.

Mine Rescue Certificates issued in 1999:

Type	Number Issued	Re-certified
Survival mine rescue	52	0
Underground mine rescue	17	25
Surface (open-pit) mine rescue	130	92
Gravel pit mine rescue	10	2
Total Certificates Issued	209	119

Mine Rescue Instructor Certificates issued in 1999:

Type	Number Issued	Re-certified
Underground	2	9
Surface (open-pit)	7	20
Total Instructor Certificates	9	29

2.3 Competitions and Awards**ROLES AND RESPONSIBILITIES**

The primary mandate of the Mines Branch is to ensure worker health and safety, public safety and suitable reclamation and protection of the land and watercourses affected by mining and exploration work.

The *Mines Act* and the Health, Safety and Reclamation Code for Mines in B.C. stipulate the legal responsibility of provincial mining companies in meeting this mandate; however, many B.C. mining companies and their individual workers voluntarily and consistently exceed these legal requirements. Through the efforts of these individuals, companies and staff of the Ministry of Energy and Mines, mining is among B.C.'s safest heavy industries.

Mine rescue competitions, first-aid competitions, and safety awards all contribute to the overall climate of safety. Reclamation awards acknowledge those companies that go beyond what is called for in their mining plans, by conducting superior research and introducing innovative techniques to restore the land.

MINE RESCUE COMPETITIONS

The Provincial Mine Rescue competitions are judged by Branch Mine Inspectors and industry personnel who are responsible for all aspects of worker and public safety in B.C.'s mining industry. This year's competition was held in Revelstoke on June 12th.

Surface Mine Rescue Champions

The East Kootenay Zone competitions were held in Sparwood on May 29th. The participating teams were as follows:

- Manalta Creek Mines — Line Creek Resources
- Fording Coal Ltd. — Greenhills Operations
- Elkview Coal Corporation
- Fording Coal Ltd. — Coal Mountain

The North Zone competitions were held in Revelstoke on June 10th. The participating mines were as follows:

- Thompson Creek Mining — Endako Mines
- Huckleberry
- Bullmoose Operating Corp.
- Quintette Operating Corp.
- Mount Polley

The first, second and third placed teams from each regional zone are eligible to compete in the provincial competition on June 10, 2000 in Kimberley. These teams are:

East Kootenay Zone

- Manalta Coal Ltd. — Line Creek Resources
- Fording Coal Ltd. — Greenhills Operations
- Elkview Coal Corp.

North Zone

- Bullmoose Operating Corp.
- Thompson Creek Mining — Endako Mines
- Quintette Operating Corp.

Provincial Competition

Surface Mine Rescue Champions

The team from Quintette Operating Corp. won the 1999 surface mine competition and is the provincial champion. Team members were: Brad Toth (Captain), Arnie Budd (Vice-Captain), Brian Bartlett, Brian Dueck, Ken Drover, Beb Fenney, Don Emberley, Geoff Challmör and Garthe Tippe (Coach).

Surface Bench Competition

The surface bench competition originated in 1995. The trophy is awarded to the surface mine rescue team that excels at the practical bench competition. The practical bench task is designed to test the individual team members on their knowledge and practical skills in mine rescue equipment and techniques. The competition is held in memory of Maurice Boisse, Mine Rescue Team Coach, Island Copper Mine. The award was won in 1999 by Elkview Coal Corporation.

Underground Mine Rescue Champions

Three underground mine rescue teams competed in the provincial competitions in 1999 as follows:

- Homestake Canada Inc. — Eskay Creek Mine
- Cominco Ltd. — Sullivan Mine
- Boliden Westmin (Canada) Ltd. — Myra Falls Operations

Boliden Westmin (Canada) Ltd. — Myra Falls Operations team won the underground mine rescue competition and are the provincial champions. Team members were: Rik Kretzschmar (Captain), Joe Fic (Vice-Captain), Nigel King, Dayton Ostrosser, Keith Notter, Rory McFadden, Rod Fenton, Wilf Penney (Coach) and Bill Conley (Coach).

Underground Bench Competition

The underground bench competition originated in 1978. The competition is held in memory of the late Barry Abbott, Captain of the Cominco HB mine rescue team, who in 1976 won the Canadian

Championship. The award was won by the team from Boliden Westmin (Canada) Ltd. — Myra Falls Operations, Rick Kretzschmar (Captain).

Underground Bench Technician

The underground bench technician plays a very important role prior to and during a mine emergency. The Technician is responsible for the care, maintenance and servicing of the mine rescue teams' breathing apparatus. The underground bench technician task was prepared to test the technician's skills and competency at assembling and testing breathing apparatus. The bench technician competition was won by Rory McFadden of Boliden Westmin (Canada) Ltd. — Myra Falls Operation.

First Aid Competitions

In the first-aid category there are two separate competitions; three-person first-aid competition; and the first-aid component of the underground and surface mine rescue competition.

Three-Person First Aid

The first provincial miner's three-person first-aid competition was held in 1978. The competition simulates accident situations — one team member acts as the patient and the other two team members render first aid. The St. John's standard course is the training standard, and only those who work in or about a mine are permitted to enter this competition.

This competition was designed as an extension of training for workers in basic first-aid skills, in order that they may assist their fellow worker at the face or at the work place in the event of an injury or medical emergency.

Competing teams at the provincial level were as follows:

- Huckleberry — 2 Teams
- Quintette Operating Corp.
- Fording Coal — Fording River Operations

- Cominco Ltd. — Sullivan Mine
- Cominco Ltd. — Sullivan Concentrator

The 1999 champion team was from Cominco — Sullivan Mine. The team members were Rick Peacosh (Captain), Vic Mann, Cal Kilback and Mike Topping (Coach).

First-Aid Component

The judging of the first-aid component is in conjunction with the provincial surface and underground mine rescue competition.

The National Western Regional Competitions

To improve Canada's mine rescue mutual aid response capability, the national mine rescue committee, consisting of representatives from across Canada, has divided the country into three specific regions — East, Central and West. The rationale is based on the expediency of responding with teams and equipment from adjacent provinces and territories and to coordinate procedures within those jurisdictions.

The national western regional committee, consisting of representatives from Alberta, B.C., Saskatchewan, Northwest Territories, United States and the Yukon Territories, in conjunction with the city of Fernie (sponsor of the event), initiated underground and surface mine rescue competitions in 1993. The competitions are conducted on a biennial basis and serve to provide a medium for mine rescue teams to exercise their skills and to promote an interchange of procedures and training standards.

The Fourth National Western Regional Mine Rescue Competition was held in Fernie, B.C. on Sept. 10 and 11, 1999.

The teams eligible to compete in 1999 were the underground and surface mine rescue winners from the 1998 and 1999 provincial, territorial and United

States competition events. The winning teams in 1998 from B.C. were:

- Cominco Ltd. — Sullivan Mine (underground)
- Highland Valley Copper (surface)

The winning teams in 1999 from B.C. were:

- Boliden Westmin (Canada) Ltd. — Myra Falls Operations (underground)
- Quintette Operating Corp. (surface)

SAFETY AWARDS COMPETITIONS

The presentation of awards at the 38th (1999) Annual Mine Safety Awards will take place at the Hyatt Regency Hotel in Vancouver on May 10, 2000. The winners for 1999 were as follows:

Small Underground Mines

This award was donated by the West Kootenay Mine and Industrial Safety Association in 1951 to encourage and promote safety in small underground mines. Since 1956, the competition has been open to qualifying mines throughout the province. The award is given to the mine having the lowest compensable accident rate after working from 2,500 to 30,000 shifts per year, at least one third of which were underground. The mine must have operated for at least nine months during the calendar year. A fatality automatically disqualifies a mine for that year. The 1999 winner was Quinsam Operating Corp. — Quinsam Coal.

Open-Pit Mines and Quarrie

The John Ash Award is presented to the mine that has worked more than 1,000,000 hours in a year and attained the lowest compensable injury frequency rate. The 1999 winner was Highland Valley Copper.

The Edward Prior Safety Award is presented to the mine with the lowest compensable injury frequency rate for 200,000 to 1,000,000 hours worked. The 1999 award was won by Elkview Coal Corporation.

The Stewart-O'Brian Safety Award is presented to the mine with the lowest compensable injury frequency rate for 35,000 to 200,000 hours worked. The award was shared by nine mines:

- Allard Contractors Ltd. — Pit "D"
- Ash Grove Cement Company — Blubber Bay Quarry
- Fraser Valley Aggregates — Pit No. 15
- Jack Cewe Ltd. — Pipeline Road Quarry
- Lafarge Construction Materials — Central Aggregates
- Pitt River Quarries Ltd. — Pitt Meadows
- Steelhead Aggregates Ltd. — Skway Pit
- Toews Bros. Bulldozing — Sumas Shale Quarry
- Westroc Inc. — Elkhorn Mine and Extension

Certificates of Achievement

Certificates of achievement are presented to those mines with a zero compensable injury frequency rate and which have accumulated 15,000 to 35,000 employee hours. There were a total of four mines that qualified for certificates:

- Allard Contractors Ltd. — Mission Pit
- Jack Cewe Ltd. — Treat Creek/Jervis Inlet
- Lafarge Construction Materials — Cannon Pit, Mission
- Steelhead Aggregates Ltd. — Cannor Road Pit

Joint Occupational Health and Safety Committee

This award is presented to the occupational health and safety committee at a mine that has demonstrated excellence in its operations, enhanced worker safety awareness and/or made significant improvements. The 1999 award went to Elkview Coal Corporation.

NATIONAL SAFETY AWARDS —

JOHN T. RYAN TROPHIES

The John T. Ryan trophies are awarded by the Mine Safety Appliances Canada Limited as a memorial to the founder of the company. The 1999 Canada

trophies were awarded by the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) to the metal mine, the coal mine and the select mine which in the previous year (1998) experienced the lowest number of compensable accidents per million employee hours in all of Canada. There are two trophy categories, Canada and Regional.

Metalliferous Underground Mines

Awards for this category include a Canadian trophy and four regional trophies. B.C. mines compete in the B.C. and Yukon region, based on statistics from 1998. The 1999 Canada winner was Cogema Resources Ind., Cluff Lake Mine, Saskatoon, Saskatchewan. The 1999 regional winner from B.C. and Yukon was Homestake Canada Inc. — Eskay Creek Mine.

Coal Mines

There is a single Canadian trophy in this category which recognizes both surface and underground mines. The presentations in 1999 were given to three winners, based on statistics from 1998:

- Fording Coal Limited — Genesee Operations, Alberta
- Luscar Ltd. — Paintearth Mine, Alberta
- N.B. Coal Limited — Minto, New Brunswick

Select Mines

Awards for this category which are restricted to open-pit and strip mines for any mineral (excluding coal) were presented in 1999 based on statistics from 1998. There is a Canadian trophy and two regional trophies awarded. B.C. mines compete in the western region, which includes all of Canada, west of the Manitoba-Ontario border. The 1999 Canada trophy was won by Fording Coal Limited, Mildred Lake Operations, Fort McMurray, Alberta and the 1999 western region award was won by Syncrude Canada Ltd.

2.4 Examinations and Certifications

Section 26 of the *Mines Act* requires that every person employed at a mine, where required by the Code, be under the daily supervision of a person who holds a valid and appropriate certificate as required by the Code. The appropriate certification is specified in Part 1.12 of the Code. Recipients of a valid permanent certificate require re-examination every five years regarding their current knowledge of the Code.

BOARD OF EXAMINERS

The Board of Examiners comprises the Chief Inspector of Mines as chair and other inspectors appointed by the Chief Inspector. In 1999 F.W. (Fred) Hermann chaired the board, with R. Booth, B. Good, E. Mehr and J. Worsfold (administrator) as members. The board is responsible for:

- examining applicants for shiftboss certificates and certificates of competency;
- considering applications for interchange certificates of competency;
- issuing certificates; and,
- conducting a review of all suspended certificates.

The board is also responsible for administering blasting and supervisor certification.

Shiftboss Certificates

Seven different types of shiftboss certificates are issued:

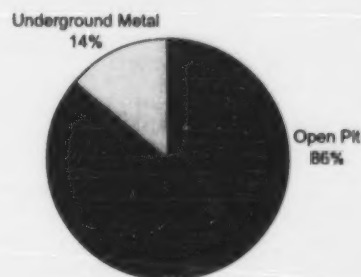
- Open-pit
- Open-pit restricted (sand and gravel pit)
- Open-pit restricted (placer)
- Underground metal
- Underground restricted (crushing and conveying)
- Underground restricted (placer)
- Underground coal (statistics included under certificate of competency)

A provisional certificate, which may be issued on a one-time basis, is valid for a period of six months.

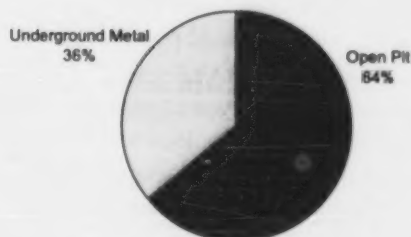
An applicant for a shiftboss certificate must hold an appropriate blasting certificate (if blasting is carried out) a mine rescue certificate (surface or underground as required), and a valid first-aid certificate. The applicant must also have obtained acceptable experience in and about a mine and pass a written examination on knowledge of the *Mines Act* and the Code.

Under part 1.13.10(1) of the Code, a holder of a shiftboss certificate must revalidate every five years. This is accomplished by successfully writing an examination on knowledge of the *Mines Act* and the Code as well as holding valid appropriate supporting certifications (blasting, mine rescue and first aid).

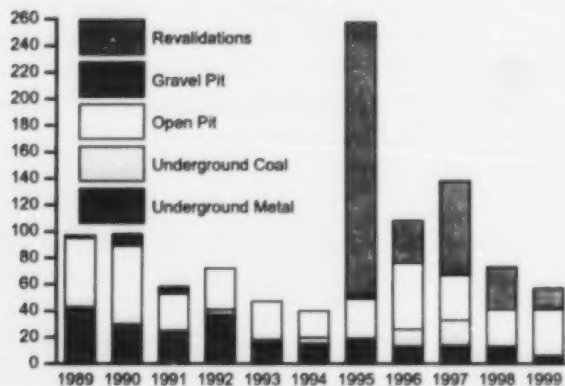
New Shiftboss Certificates Issued by Type 1999



Revalidated Shiftboss Certificates Issued by Type 1999



**Shiftboss Certificates Issued by Type
1989-1999**



Total Shiftboss Certification Activity 1999

Activity	New Certificates	Revalidation
Applications received.....	57	16
Examinations written	45	16
Number passed	43	16
Number of permanent certificates issued.....	43	14
Provisional certificates issued	12	0

Shiftboss Certificate Suspensions (Part 1.13.12 of the Code)

In 1999 there was one shiftboss certificate suspension.

1. Underground Certificate #UG2315:
Suspended for six months (July 5, 1999 - Jan. 5, 2000), under Parts 3.3.1 and 8.6.25 Health, Safety and Reclamation Code for Mines in B.C. (Code). Part 3.3.1 requires that any work involved in correcting an unusual hazard be personally supervised by an authorized person and further requires that any such work be carried out in accordance with safe work practices and in compliance with the Code. Part 8.6.25 requires pre-approval of the district inspector before a central blasting system is used or modified.

Reinstatement Requirements: None stated.

CERTIFICATES OF COMPETENCY

Managers and certain other supervisory officials at an underground coal mine, when required by the Chief Inspector must hold a certificate of competency. Three types of certificate are issued:

- a first-class certificate which is required when 30 or more persons are employed underground;
- a second-class certificate which is required when fewer than 30 persons are employed underground; and,
- an underground coal shiftboss certificate may be used if fewer than 10 persons are employed.

An applicant for a certificate of competency must hold the necessary academic certification, have obtained acceptable experience and must pass written examinations on mining practice and technology and on knowledge of the *Mines Act* and the Code. An interchange certificate may be granted to an applicant who holds an equivalent certificate granted by a jurisdiction outside the province, when they have proven their knowledge of the Code.

There were no new first- or second-class certificates of competency issued in 1999. Two revalidations were processed (one for each of the categories).

Total Underground Coal Shiftboss Certification

There were no new or revalidated certificates processed. One application was received.

Supervisor Certificates

Every worker, other than those supervised by a shiftboss or the holder of a certificate of competency, and other than office employees, must work under the supervision of the holder of a supervisor certificate. Currently, four types of supervisor certificates are issued:

- Open-pit
- Sand and gravel or placer

- Underground
- Exploration

Where 12 workers or less are employed in a surface mine operation, supervision by the holder of a supervisor certificate, rather than the shiftboss certificate, may be acceptable.

An applicant for a supervisor certificate may be required to hold a valid first-aid certificate and must pass a written examination on knowledge of the *Mines Act* and the Code. A provisional certificate, which may be issued on a one-time basis by the mine manager, is valid for a period of six months. A supervisor certificate must be revalidated every five years (part 1.13.10(2) of the Code) by successful examination on knowledge of the *Mines Act* and the Code. The holder may also be required to hold a valid first-aid certificate.

Supervisor Certificate Statistics Activity 1999

	New	Revalidated
Applications received	333	107
Examinations written	285	110
Number passed	271	108
Number of permanent certificates issued	264	107
No. of provisional certificates issued	62	0

Supervisor Certificate Suspension (Part 1.13.11 of the Code)

BLASTING CERTIFICATES

Blasting certification is covered under part 8.2 of the Code. Types of blasting certificates are:

- Basic
- Exploration
- Surface
- Underground
- Underground coal (Shotfirer)
- Electrical

- General-which includes all categories (except Underground Coal)

Blasting certificates do not have an expiry date. Provisional certificates can be issued for a period not exceeding 90 days. During 1999, 107 blasting certificates were issued.

Blasting Certificate Suspensions

(Part 8.2.6, 8.2.7 of the Code)

In 1999 there was one blasting certificate suspension and one cancellation of a certificate.

1. #39291 Suspended three months (Oct. 18, 1999 - Jan. 18, 2000), For contravention of Parts 8.2.1 and 8.2.2 Health, Safety and Reclamation Code for Mines in British Columbia (the Code) which requires a holder of a B.C. blasting certificate be present when explosives are being prepared to blast.

Reinstatement Requirements: None stated.

2. #37834 Cancelled July 5, 1999, For failure to provide for adequate guarding of a blast area. Part 8.6.2(1)(2) of the Code requires that the blast danger zone be cleared of all persons and ensuring that the blast danger zone is guarded. Of note is that this was the third offence recorded against this blasting certificate.

Reinstatement Requirements: The underground blasting examination must successfully be written before being issued a new certificate.

2.5 Accidents and Incidents

ACCIDENTS

The mining industry reported 268 accidents and 157 days lost to the provincial mine information system in the Mine Health and Safety Branch reports in 1999.

The following charts and graphs are an analysis of the kinds of mining injuries and accidents that occurred in 1999. Examinations were by diverse variables: cause, occupation, parts of the body, age, seniority, job experience, industry experience, location, hours into shift, overtime, shift patterns, shifts worked, contributing factors, preventative actions, source and nature of injury.

Accidents Causing Injury or Death Classified by Cause

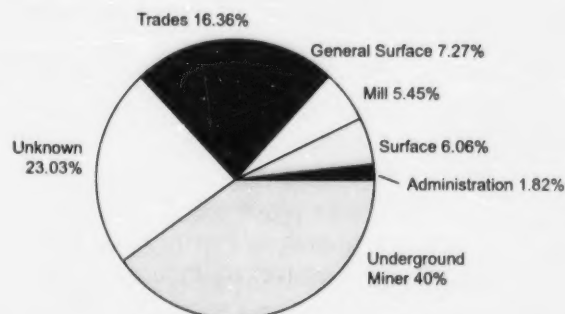
CAUSES	NO.	PERCENTAGE
Equipment, material characteristics	84	31.34
Guarding	4	1.49
Clothing and personal protective equipment	8	2.99
Confinement	20	7.46
Environment	25	9.33
Structural	16	5.97
Working surface	35	13.06
Procedures	137	40.52
Speed	5	1.87
Position, posture	42	15.67
Vehicle operator error	14	5.22
Loading, placement	16	5.97
Unsafe mixing, combining, warning, securing	9	3.36
Abuse	2	0.75
Equipment, tool usage	23	8.58
Communications	17	6.34
Bypassing safety devices	23	8.58
Improper use of body	55	20.52
*N/A, nec	18	6.72
**Unknown	8	2.99

*N/A - Not elsewhere classified

**Unknown - Not enough information provided to properly classify.

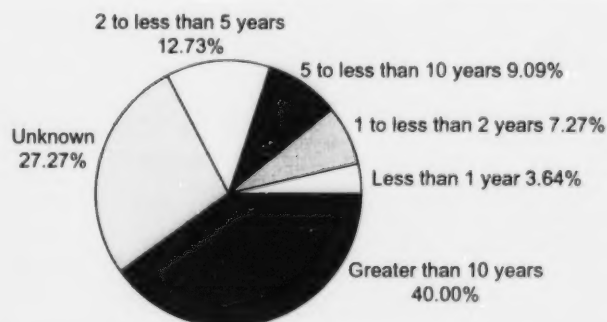
Note: The numbers shown in the table above are not intended to add up to 100 per cent as there may be several causes for one accident.

Accidents Causing Injury or Death Classified by Occupation



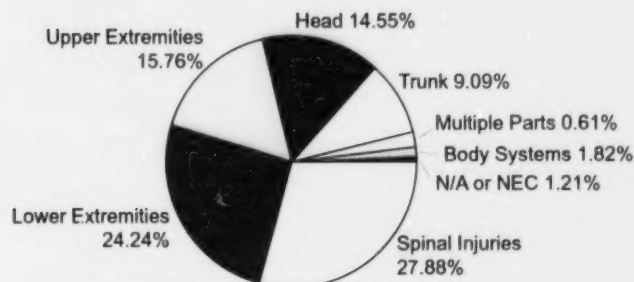
OCCUPATION	NO.	PERCENTAGE
Administration	3	1.82
Underground Miner	66	40.00
Surface	10	6.06
Mill	9	5.45
Trades	27	16.36
General Surface	12	7.27
Unknown	38	23.03

Accidents Causing Injury or Death Classified by Seniority



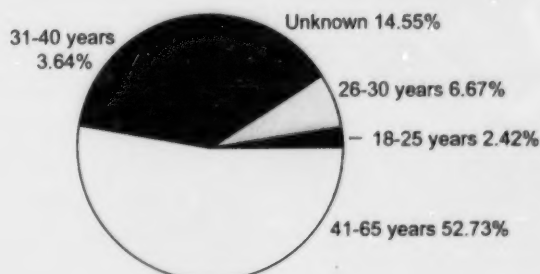
SENIORITY	NO.	PERCENTAGE
< 1 year	6	3.64
1 to < 2 yrs	12	7.27
2 to < 5 yrs	21	12.73
5 to < 10 yrs	15	9.09
> 10 yrs	66	40.00
Unknown	45	27.27

Accidents Causing Injury or Death Classified by Part of the Body



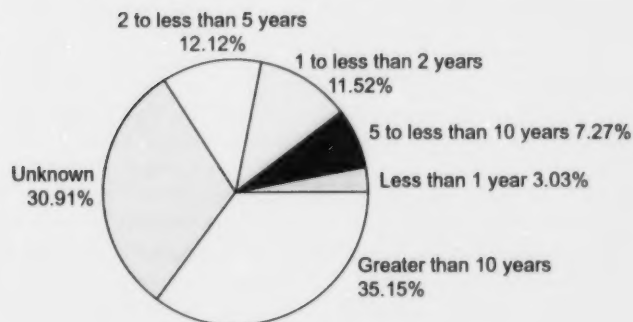
PART OF BODY	NO.	PERCENTAGE
Head	24	14.55
Spinal Injuries	46	27.88
Upper Extremities	26	15.76
Trunk	15	9.09
Lower Extremities	40	24.24
Multiple Parts	1	0.61
Body Systems	3	1.82
N/A, nec	2	1.21

Accidents Reports by Age Groupings



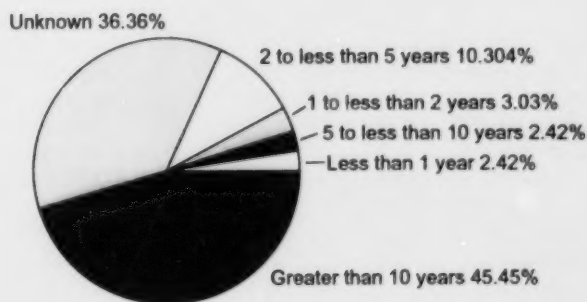
AGE	NO.	PERCENTAGE
< 18 yrs	0	0
18-25 yrs	4	2.42
26-30 yrs	11	6.67
31-40 yrs	39	23.64
41-65 yrs	87	52.73
> 65 yrs	0	0
Unknown	24	14.55

Accidents Reports by Job Experience



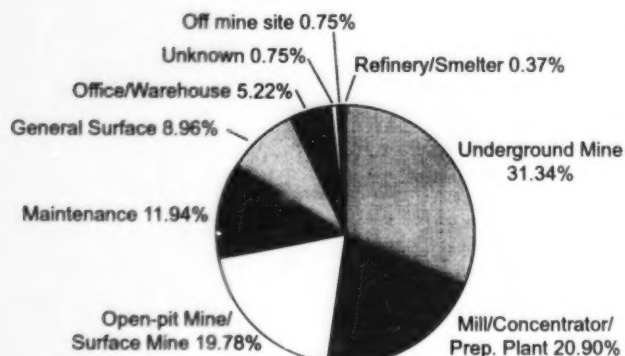
JOB EXPERIENCE	NO.	PERCENTAGE
Less than 1 yr	5	3.03
1 to < 2 yrs	19	11.52
2 to < 5 yrs	30	12.12
5 to < 10 yrs	12	7.27
> 10 yrs	58	35.15
Unknown	51	30.91

Accidents Reports by Industrial Experience



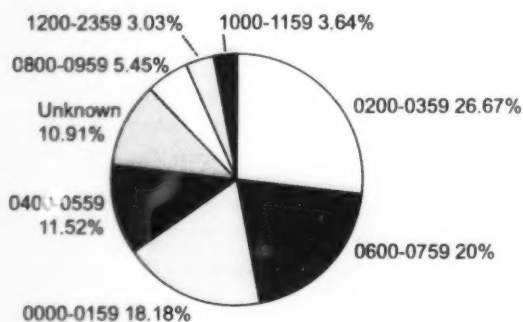
INDUSTRIAL EXPERIENCE	NO.	PERCENTAGE
> 1 yr	4	2.42
1 to < 2 yrs	5	3.03
2 to < 5 yrs	17	10.304
5 to < 10 yrs	4	2.42
> 10 yrs	75	45.45
Unknown	60	36.36

Accidents Reports by Location



LOCATION	NO.	PERCENTAGE
General Surface	24	8.96
Maintenance	32	11.94
Mill/Concentrator/Prep. Plant	56	20.90
Off mine site	2	0.75
Office/Warehouse	14	5.22
Open-pit Mine/Surface Mine	53	19.78
Surface Mine Refinery/Smelter	1	0.37
Underground Mine	84	31.34
Unknown	2	0.75

Accidents Reports by Hour into Shift



HOURS INTO SHIFT	NO.	PERCENTAGE
0001-0159	30	18.18
0200-0359	44	26.67
0400-0559	19	11.52
0600-0759	33	20.00
0800-0959	9	5.45
1000-1159	6	3.64
1200-2359	5	3.03
Unknown	18	10.91

Accident Reports by Overtime

OVERTIME	NO.	PERCENTAGE
Yes	4	2.42
No	149	90.30
Unknown	12	7.27

Accident Reports by Number of Shifts Worked

NO. OF SHIFTS WORKED	NO.	PERCENTAGE
First	31	18.79
Second	28	16.57
Third	29	17.58
Fourth	18	10.91
Fifth	4	2.42
Sixth	1	0.61
More than six	0	0
Unknown	54	32.73

Accident Reports by Contributing Factors

CONTRIBUTING FACTORS	NO.	PERCENTAGE
Personal traits	228	85.07
Training	8	2.99
Industrial relations	1	0.37
Rules and regulations	32	11.94
Management traits	6	2.24
Design, layout	79	29.48
Policies and procedures	16	5.97
Maintenance	10	3.73
N/A, nec	32	11.94
Unknown	12	4.48

Note: The numbers in the table shown above are not intended to add up to 100 per cent as there may be several contributing factors for one accident.

Preventative Actions Report

PREVENTATIVE ACTIONS (Actions to improve)	NO.	PERCENTAGE
Housekeeping program	9	3.36
Inspections	19	7.09
Lighting	3	1.12
Maintenance program (equipment)	10	3.73
Ventilation	0	0
Appropriate safety contact to employees and record	66	24.63
Assigned additional help	5	1.87
Clean up or clean up (incl. sanding, salting)	14	5.22
Design or construction	38	14.18
Correction of unnecessary congestion, relocate	5	1.87
Disciplinary action against person(s) involved	1	0.37
Discussed proper procedure with employee	91	33.96
Equipment/building repair or replacement	19	7.09
Establish closer supervision	8	2.99
Establish group meetings	5	1.81
Establish off-the-job training	0	0
Establish or revise safe job procedure	65	24.25
Establish planned job observation	2	0.75
Halted job until conditions improve	3	1.12
Inform all departmental supervision	29	10.82
Installation of guard or safety device	9	2.26
No action taken	10	3.73
Order use of safer materials	12	4.48
Preventative action, NEC	13	4.85
Reassignment of person(s)	2	0.75
Supply of new or improved personal protective equipment	3	1.12
Training/retrain person[s] (school)	4	1.49
Under Investigation	7	2.61
Undetermined	10	3.13
N/A (Not Applicable)	15	5.60
Unknown	9	3.36

Note: The numbers in the table shown above are not intended to add up to 100 per cent as there may be several preventative actions for one accident.

Accident Reports by Source

SOURCE	NO.	PERCENTAGE
Concentrating/maintenance equipment	4	2.42
Electrical	1	0.61
Mining equipment	38	23.03
Miscellaneous	13	7.88
People/animals/action	41	24.85
Physical conditions	24	14.55
Structures	11	6.67
Substances	38	23.03
Tools	20	12.18
Vehicles (except haulage)	5	3.03
N/A, nec	6	3.64
Unknown	15	9.09

Note: The numbers in the table shown above are not intended to add up to 100 per cent.

Accident Reports by Nature of Injury

NATURE OF INJURY	NO.	PERCENTAGE
N/A, Nec	4	0.68
Burn (chemical)	5	3.03
Burn or scald (heat) contact with hot substances	2	1.21
Concussion - brain, cerebral	1	0.61
Contusion, crushing, bruise - Intact skin surface	34	20.61
Cut, laceration, puncture - open wound	13	7.88
Fracture	8	4.85
Freezing/Frostbite	2	1.21
Hernia, rupture (incl. both inguinal sprains, strains)	74	44.85
INFLAMMATION/IRRITATION		
Bursitis, tenosynovitis, synovitis	1	0.61
Conjunctivitis	6	3.64
Inflammation or irritation of respiratory system	2	1.21
Carpal tunnel syndrome	1	0.61
RADIATION		
Undetermined	3	1.82
N/A (Not Applicable)	2	1.21
Unknown	13	7.88
Under Investigation	1	0.61

Dangerous and/or Unusual Occurrences

In 1999 the ministry reviewed requests from the mines that we stop requiring the labour intensive MINACC to be filled in at the minesite, or that the MINACC be made compatible with their systems. To this end the ministry reviewed its computer needs which resulted in a plan to develop the mine management system (MMS) to replace MIS (mine information system). This system is being developed with a staged implementation starting with the replacement of the basic mine information system, then the peripheral systems that include MINACC. This implementation will continue throughout the year 2000.

2.6 Inspection Services

Mining inspectors monitor mining activity for adherence to mining legislation and operating permits. The following pages provide summaries of the production, employment and inspection activities for all major B.C. mines in 1999.

Metal Mines

Production and Employment at Major B.C. Mines, 1999

Region Mine/Owner or Operator	Tonnes Milled	Principal Mineral	Total Average Employment
Vancouver Island			
Myra Falls Operations/Westmin Res. Ltd.	773,490	copper, lead, zinc, gold, silver	474
Thompson-Okanagan			
Highland Valley Copper/Highland Valley	30,982,997	copper, molybdenum, gold, silver	1,045
Kootenay			
Sullivan/Cominco Ltd.	1,732,270	lead, zinc, silver	674
Cariboo			
Mount Polley	7,090,655	copper, gold	241
Northwest			
Eskay Creek/Prime Resources Group Inc.	200,844	gold, silver	140
Golden Bear/North American Metals Corp.	385,000	gold, silver	80
Huckleberry	6,432,000	copper, gold, silver, molybdenum	200
Snip/Prime Resources Group Ltd.	65,000	gold	150
Northeast			
Blackdome/Claimstaker Resources Ltd.	18,001	gold, silver	80
Endako Mines Division/Placer Dome Inc	8,698,43	molybdenum	218
Kemess/Royal Oak Mines	15,557,267	copper, gold	430
Total Metal	71,807,116		3,732

Coal Mines**Production and Employment at Major B.C. Mines, 1999**

Region Mine/Owner or Operator	Tonnes Milled	Total Average Employment
Vancouver Island		
Quinsam/Hillsborough Resources Ltd.	488,394	104
Kootenay		
Coal Mountain Operations/Fording Coal Ltd	3,520,414	173
formerly (Byron Creek)		
Elkview/Elkview Coal Corp	3,875,871	513
Fording River/Fording Coal Ltd	12,936,612	795
Greenhills/Fording Coal Ltd.	5,914,322	455
Line Creek/Line Creek Resources Ltd.....	3,749,164	487
Northeast		
Bullmoose/Bullmoose Operating Corp.	1,858,462	308
Quintette/Quintette Coal Ltd.	4,427,607	560
Total Coal	36,770,846	3,395

VOLUME OF INSPECTIONS

The following figures represent inspections performed by the Mines branch. When an inspector conducts a mine site inspection on behalf of the branch, the inspector passes on to other branches anything that they may need to attend to. Note that the number of inspections is not a good indicator of the relative volume of activity of each office. Some regions

contain a few very large mining operations, whereas others contain hundreds of smaller operations. Therefore, the length of time it actually takes to conduct an inspection varies from region to region.

While conducting inspections during 1999, mines inspectors issued 3,506 orders and shut down 551 pieces of equipment.

Volume of Inspections, 1999

Inspection	Smithers	Pr. George	Cranbrook	Kamloops	Nanaimo	Van/Vic	Total
Coal-surface		9	37	2	3	24	75
Coal-underground		1		1	15	10	27
Exploration-surface	70	15	36	47	28	2	198
Exploration-underground	11		15	8	1	1	36
Quarry-mineral		3	41	20	21	3	88
Quarry-non mineral	34	16	6	13	84	1	154
Industrial minerals-underground	1		17			2	20
Metal-surface	37	21	11	33	1	55	158
Metal-underground	46	9	13	15	12	34	129
Placer-surface	80	93	12	24	6		215
Sand & Gravel	158	79	67	168	300	32	804
Abandoned	5	5	12	7	1	5	35
Other	5	5	12	7	1	5	35
Totals	462	254	287	341	493	175	2012

3.1 Inspections

Inspections carried out by all members of the regional operations, health and safety are included in the statistics reported under volume of inspections in the Mines Branch section of this report.

3.2 Notices of Work

Type/Region	Southwest	Central.....	Kootenays	Northeast.....	Northwest.....	Totals
Mineral Exploration	53	112.....	81	91	97	434
Placer	9	48	58	407	105.....	627
Quarry	13	4	11	7	5	40
Sand & Gravel	23	24	16	45	27	135
Coal Exploration	0	0	2	2	0	4
Totals	98	188.....	168	552.....	234.....	1240

Southwest = Nanaimo, Lower Mainland and Vancouver Island areas

Central = Kamloops, Okanagan and Thompson areas

Kootenay = Cranbrook and Elk Valley areas

Northeast = Prince George, Omineca, Horsefly and Valemont areas

Northwest = Smithers, Skeena and Queen Charlottes areas

4.1 Reclamation

ROLES AND RESPONSIBILITIES

Reclamation and the associated environmental protection are a major component of all mineral exploration and mine development activities in BC. Since 1969, mining companies have been required by law to reclaim all lands disturbed by mining. B.C. was one of the first jurisdictions in Canada to enact mine reclamation legislation, and the first to extend this policy to exploration sites. Mining companies are required to obtain a permit approving the mine plan, the program of protection of the land and watercourses, and the reclamation program. Mining companies also must place a security deposit with the province to ensure that the reclamation permit conditions are completed.

The environmental protection and reclamation objectives of the provinces *Mines Act* and Health, Safety and Reclamation Code are to ensure:

- land and watercourses on mine sites in B.C. are reclaimed to a level of productivity equal to that which existed prior to mining;
- disturbed lands and water courses are re-integrated into the surrounding landscape;
- mining and associated mitigation are conducted in a manner which prevents significant impacts to downstream or on-site biota; and,
- mining and associated metal leaching and acid rock drainage (ML/ARD) mitigation requirements are conducted in a manner which minimizes any reduction in the post-mining productive capability of the site.

In order to achieve these objectives, the reclamation section:

- conducts detailed technical reviews of new projects or project revisions under the Environmental Assessment Act;
- conducts detailed technical reviews and issues permits for operating and closed mines with outstanding reclamation responsibilities under section 10 of the *Mines Act*;
- inspects mine reclamation work and results;
- administers reclamation security deposits on behalf of the provincial government;
- organizes a number of provincial committees and activities which conduct technology transfer, review ministry practices and enhance government/industry/public/academia cooperation, including the technical and research committee on reclamation, the annual reclamation symposium and acid rock drainage (ARD) workshop and the ministry expert advisory committee for metal leaching and acid rock drainage (ML/ARD); and
- participates in national and international committees conducting research and technology transfer, including the mining industry's International Network for ARD Prevention (INAP) and the federal governments National Mine Environment Neutral Drainage (MEND 2000) committee.

The reclamation section has expertise in the technical areas of soil restoration, revegetation, land capability, erosion control, geology, geochemistry, and metal leaching and acid rock drainage. Technical assistance is provided from within the ministry on geotechnical and mining issues and by Ministry of Environment Lands and Parks (MELP) on biological and effluent discharge requirements.

STRUCTURE AND ORGANIZATION

The reclamation section is comprised of the manager, a senior reclamation agrologist, a senior reclamation geologist, a reclamation geologist and two administrative staff located at headquarters. There are also four reclamation inspectors located in Cranbrook, Kamloops, Prince George and Smithers.

SUMMARY OF ACTIVITIES**Permitting**

The section enforces the reclamation provisions of the *Mines Act* through permit conditions and detailed technical reviews aimed at finding environmentally sound, economically viable solutions that enable industry to remain internationally competitive without compromising the province's rigorous environmental standards.

During 1999 permitting activity remained high. One new permit was issued and 17 amendments to existing permits were made (table below).

Summary of permit activity for 1999

	Permits	Amendments	Total
Metal	1	8	9
Coal	0	6	6
Quarries	0	2	2
Total	1	16	17

In 1999, permit revisions were made at Gibraltar, Golden Bear, Huckleberry, Kemess, Cassiar, Afton, Sullivan, Island Copper, Mt. Polley, Fording River, Fording Greenhills, Quintette, Coal Mountain, Line Creek, Willow Creek and Quinsam. Metal leaching and ARD reviews were conducted for Baker, Brenda, Duthie, Equity Silver, Snip, QR Gold, Pinchi Lake, Bell, Granisle, Goldstream and Island Copper as well as mine proposals under the Environmental Assessment Act at Silvertip, Telkwa and Prosperity.

The section organized and participated on public committees reviewing activities at the Brenda, Endako, Equity Silver and Sullivan mines.

Cooperation and Consultation with Stakeholders

The section works closely with industry, other government agencies, First Nations and the public to inform them of our activities and ensure that all concerns are addressed. For reclamation permits involving mechanical disturbance of the land surface, applications are referred to other government agencies, the public, and First Nations where their interests are affected. The section provides regular assistance to MELP, Ministry of Transportation and Highways, Environment Canada, First nations and the public on ML/ARD issues.

Cooperation engendered by the reclamation section between industry, the public, government, and the academic community through its various activities continues to result in a constructive climate for information exchange and dissemination of new technology.

Reclamation is the responsibility of each mining company. In order to improve industry practices, First Nations consultation and public understanding, the ministry documents the conclusions of its technical reviews, enabling effective, constructive First Nations and public consultation. In addition, the ministry has produced specific guidelines on a number of reclamation issues including the reclamation of gravel pits and the prediction and prevention of metal leaching and acid rock drainage.

Metal Leaching and Acid Rock Drainage (ML/ARD)

The ministry has produced a provincial ML/ARD policy, a more detailed set of ML/ARD guidelines, and a manual of recommended methods for prediction of ML/ARD. These documents indicate

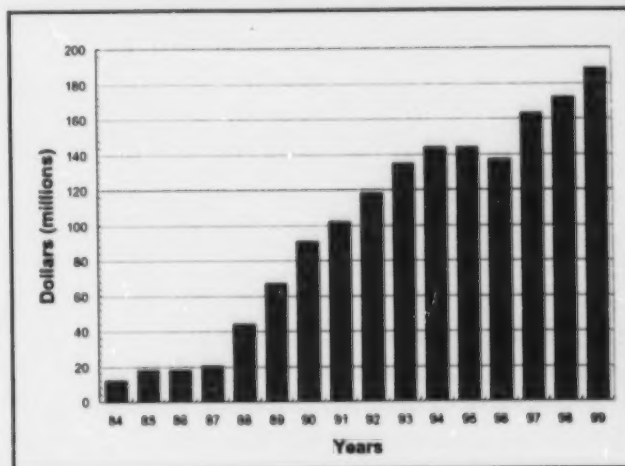
what constitutes acceptable mine design and adequate technical evidence, provide a checklist for industry, and inform the public of the regulatory conditions and the protections these afford. In 1999 the ministry and the environment sub-committee of the Mining Association of B.C. (MABC) held a workshop to review industry experience with the guidelines. The ministry also organized a meeting of the ML/ARD expert advisory committee, which consists of leading practitioners from industry, consulting and environmental advocacy groups, and was instrumental in creating the ministry documents. Both the groups endorsed the ministry guidance and regulatory work, although MABC had some concerns regarding the lack of timely response on industry submissions. Notably the guidelines have been adopted as the primary reference on this topic by the province of Ontario and for prediction by Placer Dome, and are informally used by practitioners through-out the world.

The major ML/ARD activity in 1999 was mine review, with ML/ARD providing a major part of reclamation permit conditions. ML/ARD technology transfer activities included the workshops on Molybdenum Issues in Reclamation in Kamloops, Risk Assessment in Sudbury for MEND, and Case Studies and Underwater Disposal in Vancouver.

Reclamation Securities and Funds

All mines operating in B.C. must deposit security with the government to ensure that reclamation costs do not fall on provincial taxpayers (i.e., if a mining company goes bankrupt). In the past few years, the value of security deposits has increased to reflect more closely the true costs of reclamation. The total value of securities held by the province rose from \$10 million in 1984 to more than \$187 million by the end of 1999.

Figure 1 Reclamation Security Deposits Held by the Province of B.C., 1984 to 1999



Review of Security Policy

During 1999, based on recommendations from the reclamation security policy committee, surety bonds were accepted on a trial basis.

Review of Contaminated Sites Policy

During 1999, ministry staff worked closely with industry, environmental groups and the Ministry of Environment, Lands and Parks to resolve issues related to overlap of legislation between the Mines Act and the Waste Management Act.

Mine Reclamation Symposium

The 23rd Annual Mine Reclamation Symposium was held September 20 to 24 in Kamloops, B.C. The first part of the symposium addressed "Mine Decommissioning" and a separate session addressed "Molybdenum Issues in Mine Reclamation". Delegates also toured two mines currently being decommissioned, the Brenda Mine near Peachland and the Afton mine near Kamloops.

The Annual B.C. Mine Reclamation Award

The annual reclamation award and up to five citations are awarded for outstanding achievement in mine reclamation and have been presented every year since 1977.

The 1999 British Columbia Mine Reclamation Award was presented to Afton Operating Corporation for their excellent reclamation work at the Afton mine. Afton Operating Corporation operated this copper/gold mine, milling and smelter complex from 1977 until May 1997 when production ceased permanently. Reclamation has restored natural topography and reclaimed natural systems to satisfy the objectives of re-establishing wildlife grazing and habitat, re-establishing wetland habitat, and the enhancement of forage for domestic cattle.

Five citations were also awarded to the following:

- Coal mine reclamation — was awarded to Luscar Ltd. for outstanding reclamation work at the Line Creek Mine.
- Metal mine reclamation — was awarded to Highland Valley Copper for outstanding reclamation at the Highland Valley Copper Mine.
- Exploration reclamation — was awarded to Misty Mountain Gold Ltd. for their outstanding work at the Harmony Gold Property.
- Placer mine reclamation — was awarded to Gallery Resources Ltd. for the Hannador Project located on Lightning Creek east of Quesnel.
- Special Citation — was awarded to Homestake Canada Ltd., in recognition of their reclamation activities and design of an innovative biological water treatment facility at the Nickel Plate Mine.

Technical and Research Committee on Reclamation

This committee has been active in promoting and fostering reclamation research and information exchange for more than two decades. Members are

drawn from the Ministry of Energy and Mines, Ministry of Environment, Lands and Parks, mining companies, the Mining Association of B.C., the University of Northern B.C., the University of B.C., Camosun College, and the Coal Association of Canada. This committee has been responsible for organizing the annual B.C. Mine Reclamation Symposium for the past 23 years.

INDUSTRY RECLAMATION RECORD

The mining industry in B.C. currently consists of large-scale open-pit metal mines, open-pit coal mines, underground metal mines and one underground coal mine.

Since the late 1960s, land occupied by the mining industry has steadily grown. Major coal and metal mines, which occupied less than 1,000 hectares in 1969 had, by the end of 1999, expanded to cover 39,380 hectares. Reclamation (where revegetation has been successfully established for one year or more) has occurred on over 31 per cent or 12,138 hectares (Figure 2).

Metal mines have disturbed 23,122 hectares, and 7,306 hectares (or 32 per cent), have been reclaimed (Figure 3).

Coal mines have disturbed 16,258 hectares, and 4,832 hectares (or 30 per cent) have been reclaimed (Figure 4). The sharp increase in disturbance and reclamation at metal mines during the late 1990's reflects the construction and development of three new mines Huckleberry, Mt. Polley and Kemess South and the closure and commencement of mine reclamation at others.

The data presented in Figures 2, 3 and 4 indicate that disturbance has been increasing at a faster rate than reclamation. This can largely be explained by the expansion of the mining industry during the past

30 years. Now that there has been a general industry decline, where mines are closing at a rate faster than they are opening, the rate of reclamation is expected to exceed the rate of disturbance.

Figure 2. Land Disturbed and Reclaimed by Metal and Coal Mines, 1969 -1999

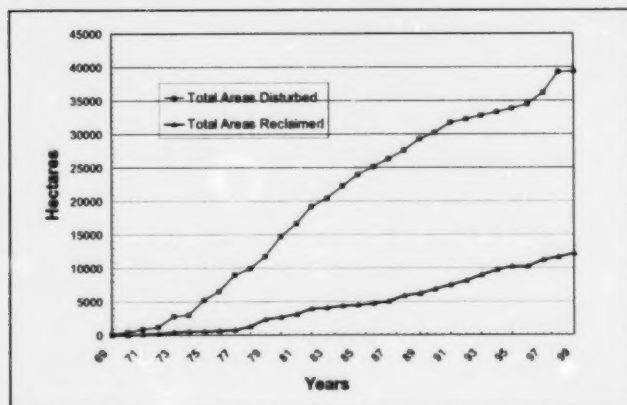


Figure 3 - Area Disturbed and Reclaimed by Metal Mines in B.C., 1969 to 1999

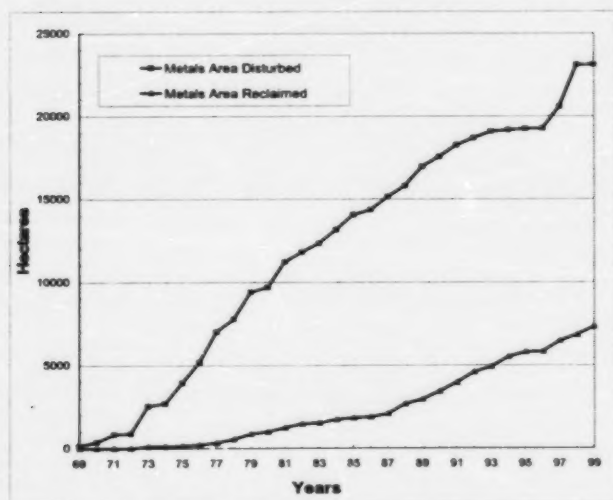
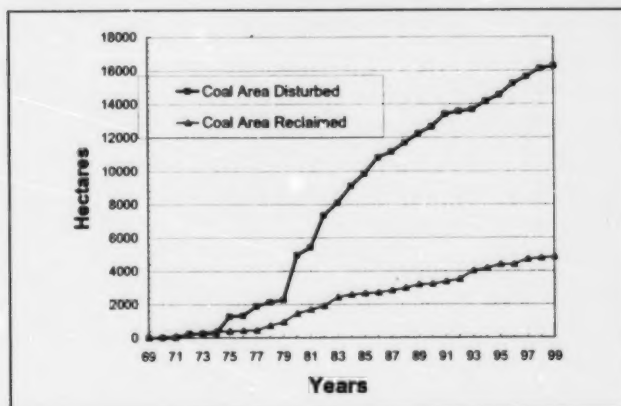


Figure 4 - Area Disturbed and Reclaimed by Coal Mines in B.C., 1969 to 1999



4.2 Geotechnical/Mining Roads

ROLES AND RESPONSIBILITIES

The geotechnical section reviews mine designs for the project review stage of the *Environmental Assessment Act* process, as well as the application of the *Mines Act* under section 10. Other duties include the inspection of major geotechnical works at mines, the assessment of geotechnical performance for worker protection and public health and safety, and for protection of land and watercourses.

The section provides in-house technical expertise and policy advice for:

- open cut and underground rock mechanics;
- large spoil structures such as waste rock dumps, soil overburden dumps and tailings impoundments; roads, including route selection, standards and construction; and,
- risk evaluation for worker protection and public health and safety, and environmental impact of geotechnical projects.

ORGANIZATION

The section consists of a manager, a senior engineer and an administrative assistant.

Summary of Activities

Compliance and Work Systems

In 1999, the geotechnical section:

- conducted a total of 47 inspections at metal, coal and other mine locations;
- issued a total of 21 *Mines Act* permits or permit amendments to metal, coal and other mine operations approving major geotechnical structures;
- participated in project reviews for Kemess South, Mt. Polley, Tulsequah, Quintette, Huckleberry, Snip, Fording River, Giant Nickel Mine, Premier, Johnny Mountain, Britannia reclamation and water treatment and Myra Falls; and,
- provided advice and design requirements on numerous other smaller project referrals or requests.

Liaison, committees and special assignments

The major activities for this section involved liaising with colleagues in regional offices, other branches, other ministries, the general public, consultants, mining company engineers and employees about work systems, compliance, incidents, guidelines and research.

CIDA-PMEM Project

Provided project planning, geotechnical audits and review of mine regulations for Peruvian Ministry of Energy and Mines.

Mining Roads

The section was active in answering queries about old mining roads, supplying information to government ministries and the general public.

